simple rule, however, they will enjoy trying to solve the problems and will look forward to mastering the more difficult levels.

**Example 2**

4 ? 7 ? 7 = 5

In the problem, division must be done first. No multiplication is required to complete the equation; therefore, division, as the next operation in the hierarchy of operations, is performed first. Then, the addition is done. The solution, then is

4 + 7 ÷ 7 = 5

In summary, most of the equations your students will be asked to complete will require a simple left to right progression of arithmetical signs. However, in those problems that require combinations of multiplication or division with addition or subtraction, it is critical that learners understand the hierarchy of operations and use that rule in providing the appropriate signs.

**Negative Numbers**

Since the problems presented in *Math In a Nutshell* are generated at random, the learner, on a rare occasion, will have to calculate negative numbers in the equations. Although numbers appearing to the right of the = sign will never be negative numbers, an equation such as the one that follows might arise and you should prepare your students for that possibility:

6 ? 9 ? 3 = 0

To achieve a result of 0 in this problem, the learner must first subtract 9 from 6 and then add the result, −3, to 3 which, of course, is 0. The solution, therefore, is

6 − 9 + 3 = 0

Your students will seldom see equations such as these but should be alert to them if they do appear.

5. **Scoring:** For each correct answer, 10 points will be added to your score. When you accumulate 50 points, you can continue or choose another level. But, be careful! Each time you give an incorrect answer you will lose 10 points. Your points will continue to accumulate until you change levels.
   You will get two chances to find the correct solution. If after the second try you still haven't discovered it, the program will allow you to see the correct answer.
6. **To see the correct solution:** If after two attempts you have not found the correct solution, you may press:
   **Apple:** CONTROL and D
   **Commodore and IBM:** F1
7. **Quitting the program:** To quit the program at any time press:
   **Apple and IBM:** ESC
   **Commodore:** F7
   You will then return to the main menu where you may either choose a new level of play or quit the program completely.

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# Math in a Nutshell™

## ALL ABOUT IT

Math can be a tough nut to crack without help. In *Math In A Nutshell*™ a friendly squirrel will help you choose the correct arithmetical operations to solve math problems at three separate levels of difficulty. At level 1 (challenging) you will see four, one digit numbers; at level 2 (more challenging) you will see five, one digit numbers; and at level 3 (a real challenge) you will see six. At each level, the number that is displayed after the = sign is the answer to the problem. Your job is to determine which combination of adding, subtracting, multiplying and dividing will give you that answer.

## YOUR GOAL

Determine which combination of +, −, ×, or ÷ will give you the stated solution to problems at any of three levels of difficulty.

## HOW TO LOAD IT

Instructions for loading the Apple IIe, IIc, and IIgs

**For the Apple IIe, IIc, and IIgs**

1. Insert the diskette into the disk drive making sure that the label is facing up and towards you.
2. Switch on the computer and the monitor.
3. The program will load automatically. **On the Apple IIe, IIc, and IIgs, make sure** CAPS/LOCK **is depressed before you run the program.**

Instructions for loading the Commodore 64 and 128

**For the Commodore 64:**

1. Insert the diskette into the disk drive making sure that the label is facing up and towards you.

2. Switch on the computer, the disk drive and the monitor.
3. The screen will display the word READY.
4. Type the following:
   LOAD "LTI", 8, 1
5. Press [RETURN]. The program will take several seconds to load. After it does, simply follow the directions on the screen to run the program.

   **For the Commodore 128:** If you are using a Commodore 128, you can use it just as if it were a Commodore 64. You may enter the C64 mode in one of two ways:

1. **With the power OFF,** hold down the [COMMODORE] key and press the ON/OFF switch. The familiar blue C64 screen display will appear with the word READY. From there, simply load the program as you would on the C64.
2. **When the Computer is running in the C128 mode,** type the BASIC command and GO 64. Then, press [RETURN]. The computer will then respond with the words: ARE YOU SURE? Press [Y] and [RETURN] simultaneously and you will automatically enter the C64 mode. Now load the program as you would with a Commodore 64.

**Instructions for loading the IBM PC**

1. The IBM or compatible machine you are using should have the following:
   * A minimum of 256K memory.
   * A 2.0 or higher version of DOS.
   * A graphics adapter card.
2. Insert the Disk Operating System (DOS) master diskette into drive A. Switch on the computer and monitor.
3. Press the [ENTER] key until the A> prompt appears. Remove the DOS diskette and insert the LTI program diskette. Type LTI and then press [ENTER].
4. The program will load in a few seconds. When it does, simply follow the directions on the screen.
5. To leave the program at any time to return to DOS or to choose another program option, press [ESC].

## HOW TO USE IT

1. **Select Options:**
   **A. Sound** — When the screen reads, DO YOU WANT SOUND?, do either of the following:
   Press [Y] to hear all sound effects.
   Press [N] to turn off all sound effects.
   **B. Directions** — When the screen reads, DO YOU WANT DIRECTIONS?, do either of the following:
   Press [Y] to see directions.
   Press [N] to not see directions.
   **C. Level of Play** — The difficulty level is based on the number of digits you will have to work with. Select from the following:
   CHALLENGING —
   Press [1] to work with problems with 4 digits.
   MORE CHALLENGING —
   Press [2] to work with problems with 5 digits.
   A REAL CHALLENGE —
   Press [3] to work with problems with 6 digits.
2. **How to start:** After you choose a level, you will see a screen that displays a squirrel sitting in a tree house with a series of single digit numbers displayed below it. At the bottom of the screen you will also see four apples which display a +, −, ×, or ÷. Between the first two numbers from the left of the screen, there will be a question mark flashing. This is where you will place the first arithmetical sign.

   To begin, press the [SPACE BAR] and watch the squirrel jump from his house to the top of the apple which displays the division sign. Move the squirrel to the left or right so that he is positioned on top of the apple displaying the sign that belongs in the space where the question mark is flashing. When you are sure that the squirrel is sitting on top of the correct sign, press [SPACE BAR]. The sign will then be displayed in the problem. Repeat the process until all the signs have been entered. To erase a sign, press [RETURN].
3. **Moving and positioning the squirrel:** You can move the squirrel from one apple to another by pressing the following keys:
   **Apple and IBM**
   Press [→] to move the squirrel right.
   Press [←] to move the squirrel left.
   **Commodore:**
   Press [>] to move the squirrel right.
   Press [<] to move the squirrel left.
4. **Solving it:** The solution to any problem will always equal the whole number that is displayed after the = sign. Therefore, you should never consider a solution that would result in a fraction. Some problems, however, will require that you multiply or divide a quantity first before you can get the correct answer. To find the solutions to these problems, students must have a knowledge of the hierarchy of arithmetical operations and the procedure for using those operations. Simply stated, the hierarchy of operations requires that multiplication and division be completed first before the operations of addition and subtraction. Gifted learners will quickly recognize the process for solving each problem and will be eager to skip to the advanced levels. Most other learners, however, will require an explanation and demonstration of how the hierarchy of operations is applied in the solution of each equation. Once this simple principle is understood, students will be able to advance through the levels by applying this useful problem-solving process.

### Hierarchy of Operations

*Math In a Nutshell* presents all equations in a horizontal format. In most cases, learners insert the appropriate arithmetical signs into the equations working in a normal left to right progression as is illustrated in the following example:

4 ? 2 ? 3 = 24

The solution requires the learner to simply supply multiplication signs:

4 × 2 × 3 = 24

In similar situations where only simple addition or subtraction is required, the same left to right progression applies:

9 ? 3 ? 7 = 5

Here the equation is completed by simply adding first and then subtracting:

9 + 3 − 7 = 5

In short, in situations where multiplication and division are required exclusively to complete the equation or in situations where addition and subtraction are required exclusively, a normal left to right progression of operations is appropriate. However, in situations where adding and subtracting operations are mixed with multiplication and division, then a hierarchy of operations must be used to properly solve the equation. EXAMPLE 1 illustrates this concept:

### Example 1

To solve the following equation, one would follow a hierarchy of operations that would require the learner to multiply first and then add:

1 ? 2 ? 3 = 7

This equation cannot result in 7 without first multiplying 2 × 3 and then adding 1 so that the equation would look like this:

1 + 2 × 3 = 7

No other solution is possible and without some instruction in the hierarchy of operations, all but the most advanced students will have difficulty with this problem. Once learners understand this